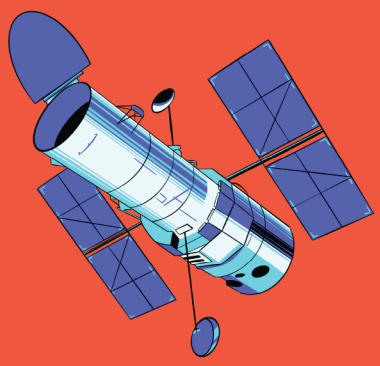
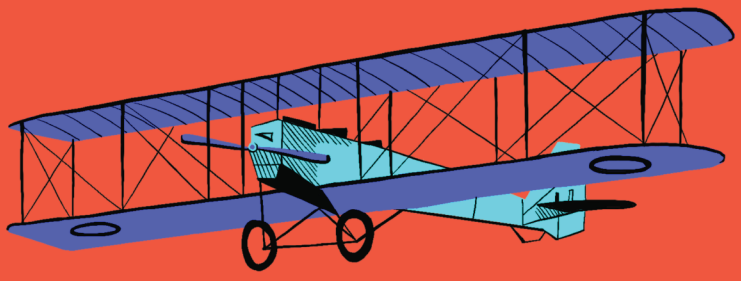
FROST SCIENCE

Celebrating American Innovation





Stars of Science

GUESS WHO

LESSON PLAN

Celebrating American Innovation

Stars of Science: Guess Who

Overview

Students will play a game exploring American scientists, engineers, and innovators and their landmark discoveries or inventions. They will then delve deeper into the work of an innovator of their choice to see how their work has influenced discoveries and inventions around the world. Students will take what they learned to represent their innovator and legacy in a creative way.

Objectives

By the end of this activity, students will be able to:

- Understand how discoveries and inventions build on each other over time.
- Represent a prominent American innovator and their pivotal discovery or invention in a creative way.

Key Messages

- American scientists, engineers, and innovators have been pivotal in advancing science through their discoveries and inventions over the past 250 years.
- The Declaration of Independence outlines the philosophy of natural rights (life, liberty, and the pursuit of happiness), grievances against the King of Great Britain, and the formal declaration of the United States as a new and independent nation.
- American innovation has been integral in pushing forward the scientific disciplines of marine science, health, paleontology, astronomy, and aeronautics.

Background Information

The Declaration of Independence

250 years ago, on July 4, 1776, the Declaration of Independence was adopted by the 13 American colonies, establishing the United States as a new, independent nation. This document outlined the philosophy of natural rights (life, liberty, and the pursuit of happiness), grievances against the King of Great Britain, and the formal declaration of the United States as a new and independent nation. The revolutionary war, which had begun in 1775, ended in 1783 with both the United States and Great Britain signing the Treaty of Paris. This was a formal recognition of the United State's independence.

This year we celebrate July 4, 2026, as the 250th anniversary of the signing of the Declaration of Independence, a milestone known as the Semiquincentennial or America250.

American Innovation

After the United States became independent, the new nation needed to become self-sufficient, no longer dependent on British manufacturing and economics. American innovation at this time was extremely important in helping the new nation manufacture and produce its own goods. Many technological advances occurred during this time, and United States scientists, engineers, and innovators began to be recognized for their discoveries and accomplishments.

The Frost Science initiative, ***America250: Celebrating American Innovation***, explored 250 Americans across five scientific disciplines. We recognize these individuals for their accomplishments and identify key themes and unique stories aligned to each discipline. Our ***America250: Celebrating American Innovation*** disciplines and themes are:

- Marine Science: Breaking the Surface and Connecting Cultures
- Health: Human Connection in Healthcare
- Paleontology: The Puzzle of Earth's Past
- Astronomy: Earthbound Observations to Interstellar Exploration
- Aeronautics & Flight: What it Takes to be Airborne

Marine Science: Breaking the Surface and Connecting Cultures

Within the field of marine science, American scientists are recognized for having pushed the boundaries of ocean exploration, from inventing the first commercially successful steamboat to the first practical screw propeller. American cartographers and members of the United States Coast Survey have also made important strides in mapping the coastlines of the United States and other important ocean features like the Gulf Stream and Atlantic Ocean floor. More recently, American scientists, engineers, and innovators have invented tools that have allowed for exploration of the deep ocean, a feat that was not previously possible with the technology available. Along with their notable discoveries and inventions, American scientist, engineers, and innovators have also worked tirelessly to protect our ocean, the animals that live there, and the resources it contains.

Health: Human Connection in Healthcare

American doctors and scientists are championed for their ability to collaborate with one another and their patients and making strides to improve medical practices around the world, from developing immunotherapy treatments for cancerous tumors to the first successful open-heart surgery. Many of the innovations in medical science and technology emerged from the collaboration between American innovators, making huge breakthroughs. For example, American breakthroughs in vaccine development include the invention of mRNA vaccines, the foundational invention that served as the basis for the Covid-19 vaccine. American health experts have also worked closely with community members to make healthcare more accessible and affordable by revolutionizing care for patients with vision problems, with HIV/AIDS, or in need of prosthetics.

Paleontology: The Puzzle of Earth's Past

The field of paleontology broke ground in America when Thomas Jefferson's interest in the field drove him to ask explorers to search for fossils in the West. American paleontology started in the 1800s as explorers discovered fossil deposits and made ground-breaking discoveries in the field. Later, American scientists would focus on how these discoveries could be used to learn about Earth's past using new technologies like radiocarbon dating, which allowed for a more accurate timeline and a better understanding of the evolutionary history of ancient life. Emerging technologies have since allowed American scientists to learn even more about ancient organisms and how it they are classified within Earth's evolutionary tree of life.

Astronomy: Earthbound Observations to Interstellar Exploration

From the discovery of comets to how we classify stars, American astronomers have shaped how we understand the universe and American innovators have developed technologies that revolutionized how we observe the universe. American ingenuity led to notable inventions and discoveries including the Hubble Space Telescope, long-cycle nickel-hydrogen batteries, and the Laser Interferometer Gravitational-Wave Observatory (LIGO). Along with America's notable inventions, American astronauts have also helped us learn a lot about our universe. The Freedom 7 mission put the first American in space and the Apollo missions put the first person on the Moon.

Aeronautics & Flight: What it Takes to be Airborne

Before modern airplanes were capable of traveling across the world, people had to have a fundamental understanding of the forces and physical properties that made flight possible. American innovators and engineers were the among the first to explore the physics of flight when the Wright brothers applied their understanding of physics to achieve powered flight for the first time in 1903. After flight became possible for the first time, American innovators and engineers began to develop new types of engines and aircraft that expanded the speed, range, and the possibilities of aviation.

Set-Up Procedure

1. Download and print out a set of **Innovator cards** for each pair of students you expect to have in class. Cut out the cards or instruct students to cut out the cards before starting the lesson.
    a. Each set of 25 cards will include five innovators from each of the following scientific disciplines: marine science, health, astronomy, aeronautics, and paleontology.
2. Print out and staple an **America250: Celebrating American Innovation Resource Guide** for each student.

Activity Procedure

Introduction:
Students will learn about various American innovators and their notable discoveries by playing a guess who-like game called Stars of Science.

What the Teacher Does	Anticipated Behaviors/Responses
1. Introduce students to America250 by asking them the following questions: *Question(s):* **Q1:** Every year we celebrate July 4th. Can someone share what July 4th celebrates? **Q2:** 250 years ago, on July 4th, 1776, 13 colonies adopted the Declaration of Independence. What was the purpose of this document? **Q3:** Why was American innovation so important after the United States was established as an independent nation?	1. Students will raise their hands to answer the questions. *Possible response(s):* **R1:** July 4th is the day, 250 years ago, that the United States achieved independence. **R2:** The purpose of the Declaration of Independence was to establish the United States as a new and independent nation. It also established the philosophy of natural rights, which include life, liberty, and the pursuit of happiness. **R3:** Once the United States was established, it was no longer dependent on resources from Great Britain and needed to find its own way to independently produce and manufacture goods.
2. Tell students that this year is the 250th anniversary of the United States, known as the semiquincentennial or America250. To celebrate, we will be taking a closer look at how American scientists, engineers, and innovators have used their creativity and collaboration to better understand the world we live in. To do this, we are going to play a game called **Stars of Science: Guess Who.** Ask students the following question: **Q1:** Have you ever played the game "Guess Who?" How do you play the game? Select at least one student to explain how to play the game.	2. Students will listen to the instructor and then raise their hands to explain the game "Guess Who." *Possible response(s):* **R1:** To play "Guess Who," each player picks the picture of one person and keeps them a secret from the other player. While looking at a lineup of people's pictures, the players have to each ask yes or no questions to try and figure out each other's secret person. The yes or no questions are usually about their characteristics.
3. Place students in pairs.	3. Students will get into pairs.

4. Tell students that there are five **Innovator Cards** from five different scientific fields: marine science, health, paleontology, astronomy, and aeronautics. Each card will display the name of the innovator, their picture, the year of one of their major achievements, and some information about them and their contribution to their field. **The America250: Celebrating American Innovation Resource Guide** contains 250 individuals spanning all five science disciplines along with the year of one of their notable achievements and information about them.	4. - 5. Students will listen.
5. To play the game, students will each randomly draw one card from the deck of 25 innovator cards, keeping their person's identity secret from the other player. Each player will then take turns using an **America250: Celebrating American Innovation Resource Guide** to ask yes or no questions and try to guess the other player's card. The player that guesses the name of their opponent's person first wins. Each pair may play multiple times if they finish their games quickly.	
6. Hand out **Innovator Cards and America250: Celebrating American Innovation Resource Guides** to each pair of students. Students can then begin playing the game. Give students around 15-20 minutes to play several rounds. While students are playing the game, walk around and listen in on the types of questions that they are asking one another. If students are having a hard time asking questions that help them narrow down the number of possible innovators, give them at least one example question they could ask. For example: "Is your innovator in the field of marine science?" or "Did your innovator make their discovery in the 1800s?"	6. Students will receive their **Innovator Cards and America250: Celebrating American Innovation Resource Guides** before starting their first game. If students have any questions about the game, they will raise their hands to ask the instructor.

7. At the end of the activity, ask students to share at least one thing they learned about an American innovator from the game.	7. Students will raise their hands to share something they learned about one of the American innovators during the game.
Body of the lesson: *Students will choose one scientist, engineer, or innovator from the America250 resource guide to represent in a creative way.*	
What the Teacher Does	**Anticipated Behaviors/Responses**
1. Tell students that now that they are more familiar with America250, they will be learning more about one American innovator and their influence on the world. Tell students that inventions and discoveries are rarely isolated events. Scientists, engineers, and innovators often build upon the work of others or find new ways to use or apply different inventions or discoveries. For example, actress and inventor Hedy Lamarr developed a frequency hopping technology that was originally created as a way for the United States Navy to control guided torpedoes and avoid the jamming technology used by their enemies during World War II. This invention was later improved to help Bluetooth devices reduce interference in areas where lots of people might be using Bluetooth devices at the same time.	1. Students will listen.
2. Ask students to look over the innovators in the **America250: Celebrating American Innovation Resource Guide** and choose one person that draws their interest. Share with students that they will be creating something that represents their innovator's discovery or invention. Optionally, make this activity a group project or give students the choice between completing the assignment on their own or completing the assignment in small groups. If students are working in groups, they should be no larger than 4 students.	2. Students will look over the innovators in the **America250: Celebrating American Innovation Resource Guide** and choose one person that draws their interest.

3. After students have selected their innovator, tell students that they can be creative in how they present their information, but they must include three things: 1. A specific invention or discovery that is mentioned in their innovator's blurb in the **America250: Celebrating American Innovation Resource Guide**. 2. How the innovator's invention or discovery is an example of American innovation. 3. At least 3 other discoveries or inventions that built on this innovator's work If desired, give students several examples of ways they can represent their innovator: • Instagram post • Skit • Blog post • Article • Comic strip • Press release • Write a rap or poem • Canva presentation • Drawing	3. Students will listen.
4. Give students time in class to research their innovator and decide how they would like to represent their work. Alternatively, assign the project as a homework assignment. If students are completing the project as homework, make sure to assign a due date for the project. Ask students to raise their hands if they have any questions about their assignment.	4. Students will listen and raise their hand if they have any questions related to the assignment.
Conclusion: *Students will present their creative representation of their innovator to the class.*	
What the Teacher Does	**Anticipated Behaviors/Responses**
1. Give each student or group time to present their innovator to the class using their creative representation.	1. Students will listen as individuals or groups present their innovator.

Notes

This activity is designed to be flexible. The amount of time teachers spend on each part of this lesson is at their discretion. This lesson was designed to be taught over several class periods but can also be taught in one class period if needed. Teachers can also teach or assign each part of the lesson over the course of multiple weeks.

This activity was designed for students in grades 9-12, but the **America250: Celebrating American Innovation Resource Guide** can also be adapted and used for other grade levels:

Grades K-2

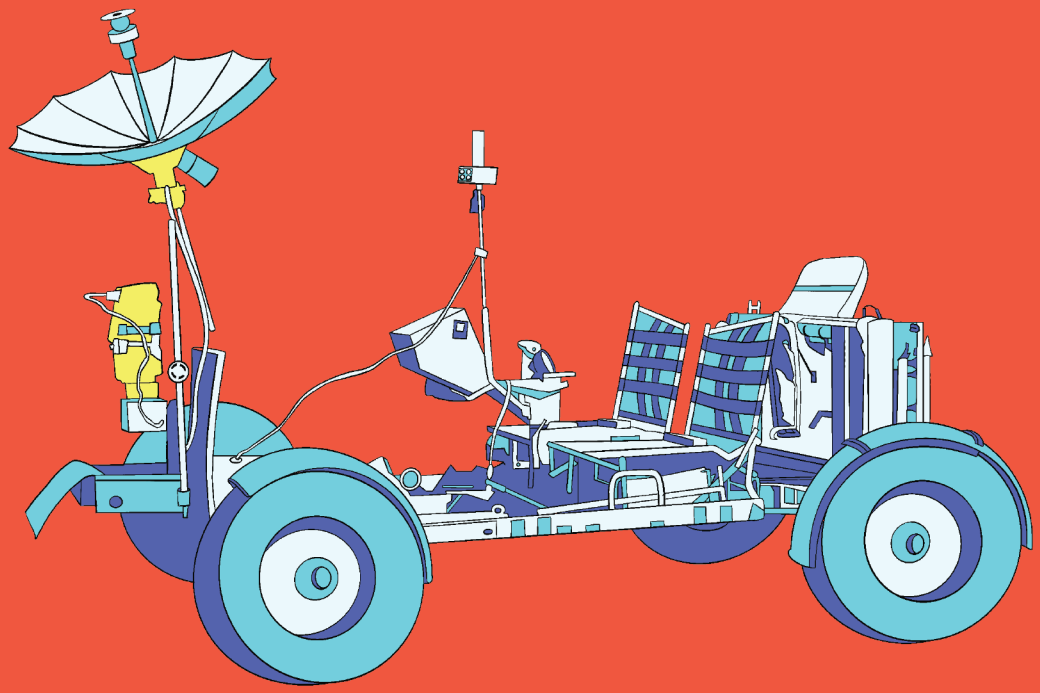
Play a game of four corners, assigning each corner of the room a different science field: marine science, health, paleontology, and astronomy/aeronautics. Select 10-15 different **Innovator Cards**, making sure there are several innovators from each field. Read the discovery or invention made by each innovator out loud and tell students to run to the corner of the room they think it matches. After students have run to one corner of the room, give students more information about the discovery or invention using the **America250: Celebrating American Innovation Resource Guide.** Students in the wrong corner of the room will be out. The game ends when there is only one student left or the teacher runs out of **Innovator Cards**. If students become upset when they are out, ask them to help you pick the next **Innovator Card** or share the correct answer. Play several rounds of the game.

Grades 3-5

Older students can play the game of **Stars of Science: Guess Who** contained in the introduction of this lesson. Keep in mind that this game may take longer to play as it would be harder for younger students to quickly flip through the resource guide. To adjust the game and make it quicker, consider playing the game as a whole class, with one student randomly selecting an **Innovator Card** and asking the whole class to take turns asking questions to narrow down the list of innovators and identify the person on the card. Students could also play a game of charades as a class using the **Innovator Cards**, with one student picking a random **Innovator Card** and acting it out while the rest of the class works together to guess the innovator.

Grades 6-8

Stars of Science: Guess Who can be played with this age group in pairs as written in the lesson or as a class as written in the Grades 3-5 modification, depending on the teacher's preference. The body of the lesson can also be done with middle school students as written in the lesson. For grades 6-8, students should work in groups to choose an innovator from the **America250: Celebrating American Innovation Resource Guide,** research their inventions or discoveries, and create something that represents the innovator and their work.



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